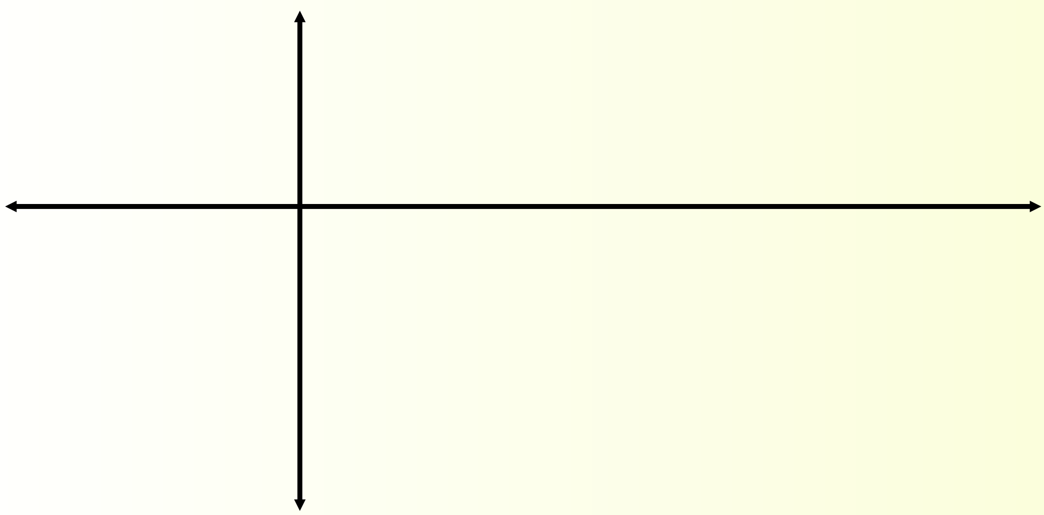
Alg. 2 Warm Up #12-1

1. Describe the transformations of y = sinx that give us $y = 3 \sin\left(x + \frac{\pi}{4}\right) - 2$, then graph one cycle.

Label the line of oscillation.



HW Questions:

Review & Preview

7-144. Use what you learned in class to complete parts (a) through (c) below.

a. Describe what the graph of $y = 3\sin(\frac{1}{2}x)$ will look like compared to the graph of $y = \sin x$. Vertical stretch of 3, so the amplitude = 3

Horizontal Stretch, It will have half a cycle in 2π, Period = 4π

b. Sketch both graphs on the same set of axes.

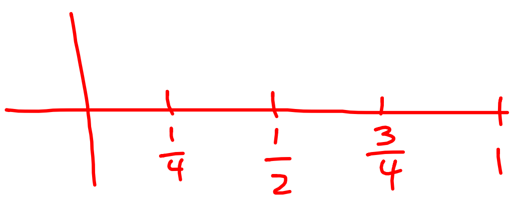
c. Explain the similarities and differences between the two graphs.

7-145. What is the period of $y = \sin(2\pi x)$? How do you know?

$b = 2\pi$

$\text{Per} = \frac{2\pi}{2\pi} = 1.$

$\text{Per} = \frac{2\pi}{b}$



7-146. Colleen and Jolleen both used their calculators to find $\sin 30°$. Colleen got $\sin 30° = -0.9880316241$, but Jolleen got $\sin 30° = 0.5$. Is one of their calculators broken, or is something else going on? Why did they get different answers?

7-147. Ceirin's teacher promised a quiz for the next day, so Ceirin called Adel to review what they had done in class. *"Suppose I have $y = \sin 2x$," said Ceirin, "what will its graph look like?"*

"It will be horizontally compressed by a factor of 2," replied Adel, *"so the period must be π."*

"Okay, now let's say I want to shift it one unit to the right. Do I just subtract 1 from x, like always?"

$y = \sin(2x-1)$ $\quad$ $y = \sin 2(x-1)$

"I think so," said Adel, *"but let's check on the graphing calculator."* They proceeded to check on their calculators. After a few moments they both spoke at the same time.

$2(x-\frac{1}{2})$

"Rats," said Ceirin, *"it isn't right."*

"Cool," said Adel, *"it works."*

When they arrived at school the next morning, they compared the equations they had put in their graphing calculators while they talked on the phone. One had $y = \sin 2x - 1$, while the other had $y = \sin 2(x-1)$.

Which equation was correct? Did they both subtract 1 from x? Explain. Describe the rule for shifting a graph one unit to the right in a way that avoids this confusion.

7-148. George was solving the equation $(2x-1)(x+3)=4$ and he got the solutions $x=\frac{1}{2}$ and $x=-3$. Jeffrey came along and said, *"You made a big mistake! You set each factor equal to zero, but it's not equal to zero, it's equal to 4. So you have to set each factor equal to 4 and then solve."* Who is correct? Show George and Jeffrey how to solve this equation. To be sure that you are correct, check your solutions.

There is no "4 product prop."

silly.

7-149. Compute the value of each expression without using a calculator.

a. $\log(8) + \log(125)$

b. $\log_{25}(125) = y$

c. $\frac{1}{2}\log(25) + \log(20)$

d. $7^{\log_7(12)} = 12$

$\log(8 \cdot 125)$

$\log_{10} 1{,}000$

$\boxed{3}$

because $10^3 = 1{,}000$

Write in exponent form:

$25^y = 125$

Now make the bases match → Base 5

$(5^2)^y = 5^3$

$2y = 3$

$y = \frac{3}{2}$

so $\log_{25}(125) = \boxed{\frac{3}{2}}$

$7^{\log_7 12} = y$

$\log_7 y = \log_7 12$

$\log_2 8$

7-150. An exponential function $y = km^x + b$ passes through (3, 7.5) and (4, 6.25). It also has an asymptote at $y = 5$. → up 5, so $b=5$

a. Find the equation of the function.

b. If the equation also passes through (8, w), what is the value of w?

$y = km^x + 5$

Now put in the points to create a system of 2 equations.

$$6.25 = km^4 + 5 \qquad 7.5 = km^3 + 5$$
$$-5 \qquad -5 \qquad -5 \qquad -5$$
$$1.25 = km^4 \qquad 2.5 = km^3$$

To solve by elimination:

$$\frac{1.25}{2.5} = \frac{\cancel{k}m^4}{\cancel{k}m^3}$$

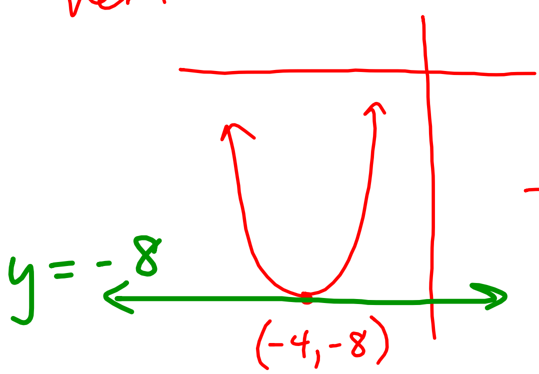
Keep going! :)

7-151. Consider the equation $f(x) = 3(x+4)^2 - 8$.

a. Find an equation of a function $g(x)$ such that $f(x)$ and $g(x)$ intersect in only one point.

b. Find an equation of a function $h(x)$ such that $f(x)$ and $h(x)$ intersect in no points.

vertex $(-4, -8)$



The line $y = -8$ would only intersect once.

Friday's CP's:

7-141. *Without* using a graphing calculator, describe each of the following functions by stating the amplitude, period, horizontal shift, and midline (vertical shift). Using this information, sketch the graph of each function. *After* you have completed each graph, check your sketch with a graphing calculator and correct and explain any errors.

$b = 2$

$per = \frac{2\pi}{2} = \pi$

a. $y = \sin 2(x - \frac{\pi}{6})$

b. $y = 3 + \sin(\frac{1}{3}x)$

c. $y = 3\sin(4x)$ $3\sin 4(x)$

d. $y = \sin\frac{1}{2}(x+1)$

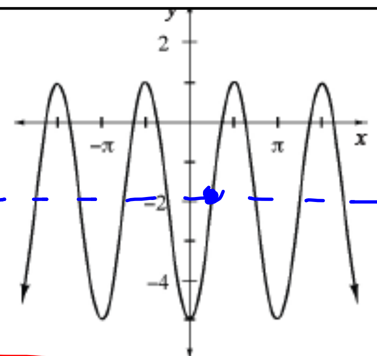
e. $y = -\sin 3(x - \frac{\pi}{3})$

f. $y = -1 + \sin(2x - \frac{\pi}{2})$

$\sin 2(x - \frac{\pi}{4})$

$y = a \sin b(x-h) + k$

7-142. Farah and Thu were working on writing the equation of a sine function for the graph at right. They figured out that the amplitude is 3, the $\boxed{\text{horizontal shift is } \frac{\pi}{4}}$ and the midline is $y = -2$. They can see that the period is π, but they disagree on the equation. Farah has written $f(x) = 3\sin 2(x - \frac{\pi}{4}) - 2$ and Thu has written $f(x) = 3\sin(2x - \frac{\pi}{4}) - 2$.



a. Whose equation is correct? How can you be sure?

b. Graph the incorrect equation and explain how it is different from the original graph.

rewrite

$f(x) = 3\sin 2(x - \frac{\pi}{8}) - 2$

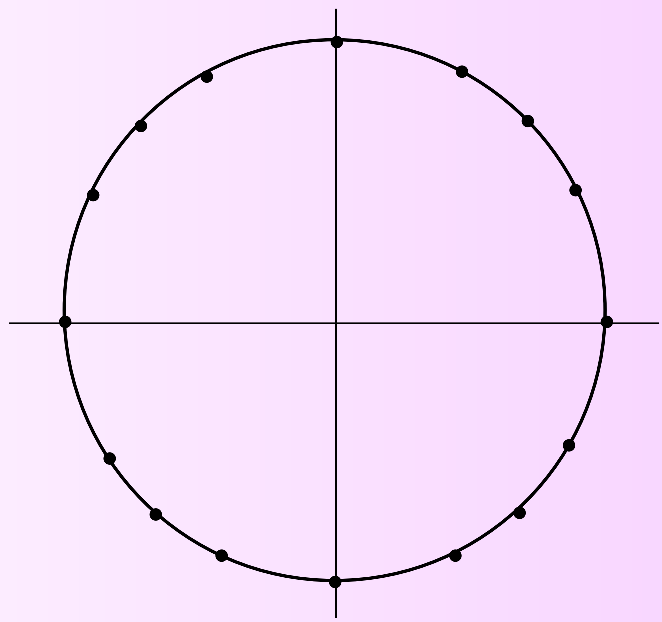
R+ $\frac{\pi}{8}$

Unit Circle as a tool...

Try to completely fill it in without looking at your notes, book or calculator.

See what you can do on your own.

We will go over it together in a few minutes.

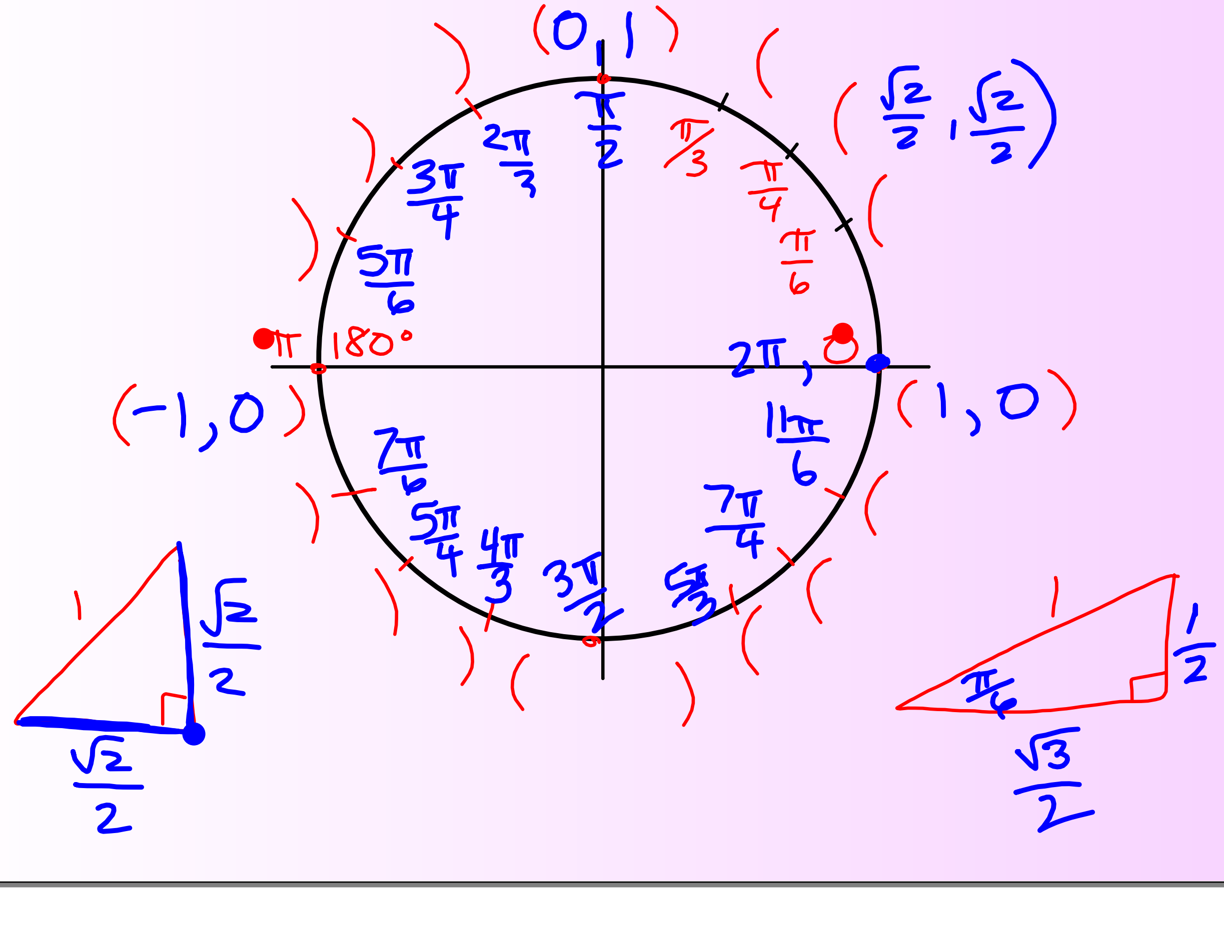


Unit Circle as a tool...

(x, y)

(cos θ, sin θ)

Try to completely fill it in without looking at your notes, book or calculator.



Practice for tomorrow's group quiz:

Solve by completing the square.
(Simplify, exact, no decimals)

$3x^2 + 15x - 2 = 0$

Solve, check for extraneous solutions:

$$\sqrt{3x - 3} - \sqrt{2x} = 1$$

Solve by completing the square.
(Simplify, exact, no decimals)

$3x^2 + 15x - 2 = 0$

$3\left(x^2 + 5x + \frac{25}{4}\right) = 2 + \frac{75}{4}$

$x = -\frac{5}{2} \pm \frac{\sqrt{249}}{6}$

Solve, check for extraneous solutions:

$\sqrt{3x - 3} - \sqrt{2x} = 1$

$x = 8 + 4\sqrt{3}$

$\sqrt{3x-3} = 1 + \sqrt{2x}$

then square both sides.

MATH NOTES

METHODS AND MEANINGS

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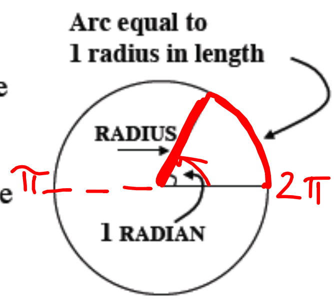
Radians

A **radian** is defined as an angular measure such that an arc length of one radius on a circle of radius one produces an angle with measure one radian. It can also be thought of as the ratio of an arc length to the radius of the corresponding circle.



The circumference of any complete circle is $2\pi r$ units, so the corresponding radian measure is $\frac{2\pi r}{r} = 2\pi$. Thus, there are 2π radians in a complete circle.

$\pi \approx 3.14$ radian

$2\pi \approx 6.28$ radians

1 radian $\approx 57°$

$\pi = 180°$

$2\pi = 360°$

Convert

$\theta \cdot \frac{180°}{\pi \text{ rad.}}$ or $\theta \cdot \frac{\pi \text{ rad.}}{180°}$

METHODS AND MEANINGS

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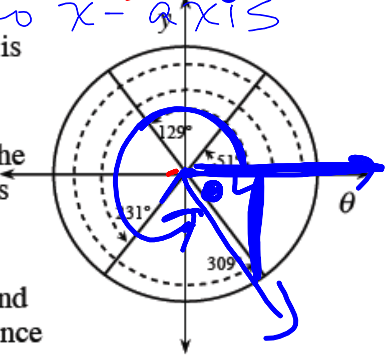
MATH NOTES

$\theta' =$ Reference Angle

acute, positive

always next to x-axis

For every angle of rotation, there is an angle in the first quadrant ($0 \le \theta \le 90°$) whose cosine and sine have the same absolute values as the cosine and sine of the original angle. This first-quadrant angle is called the **reference angle**.



For example, the angles 51°, 129°, 231°, and 309° (pictured at right) all share the reference angle of 51°.

Quad I $\theta \rightarrow \theta'$

Quad II $180 - \theta = \theta'$

Quad III $\theta - 180° = \theta'$

Quad IV $360 - \theta = \theta'$

MATH NOTES

METHODS AND MEANINGS

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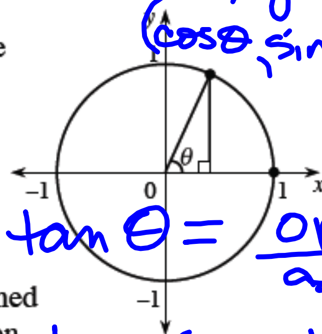
radius = 1

Sine, Cosine, and Tangent

For any real number θ, the **sine of θ**, denoted $\sin\theta$, is the y-coordinate of the point on the unit circle reached by a rotation of θ radians from **standard position** (counter-clockwise starting from the positive x-axis).

(x, y)

$(\cos\theta, \sin\theta)$



$\tan\theta = \frac{opp}{adj}$

The **cosine of θ**, denoted $\cos\theta$, is the x-coordinate of the point on the unit circle reached by a rotation of θ radians from standard position.

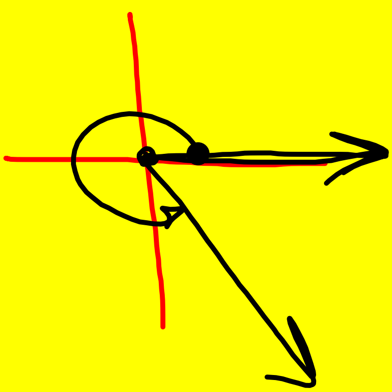
$\tan\theta = \frac{y}{x}$

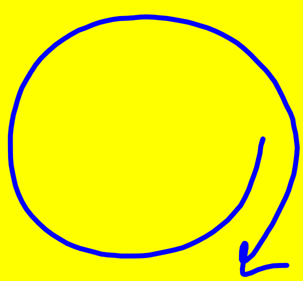
The **tangent of θ**, denoted by $\tan\theta$, is the slope of the terminal ray of an angle (the radius) formed by a rotation of θ radians in standard position.

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

The $\boxed{\textbf{Pythagorean Identity}, \sin^2\theta + \cos^2\theta = 1}$ describes the relationship between the side lengths of a right triangle formed in a unit circle with the radius as the hypotenuse.

$(\sin\theta)^2 + (\cos\theta)^2 = 1$





HW: 7-

#158 ---> 166

Home stretch: Finish strong!

Group Quiz: Tuesday

(Grapher and notes ok. Topics:
Graphing a transformed sine graph
Solving equations with radicals
Solve by completing the square
Special Triangles)

Unit Circle Quiz: Thursday
Test 7: Friday